

REMARKS

In the last Office Action, the Examiner objected to the title of the invention as being unclear. The abstract and claims were objected to as containing informalities. Claims 2, 3 and 8 were rejected under 35 U.S.C. §112, second paragraph, for indefiniteness. Claims 1, 5-7, and 9-12 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 2,983,779 to Dumire et al. ("Dumire"). Claims 1-12 were rejected under 35 U.S.C. §103(a) as being unpatentable over Dumire in view of U.S. Patent No. 4,009,825 to Jackson. Claims 1, 4, 5, 6, 7 and 9-12 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 3,327,279 to Lombard alone or taken in view of Dumire, U.S. Patent No. 983,258 to Bliss and U.S. Patent No. 5,906,513 to Peterson et al. ("Peterson"). Claims 2, 3 and 8 were rejected under 35 U.S.C. §103(a) as being unpatentable over Lombard in view of Bliss, Dumire and Peterson. Additional art was cited of interest.

In accordance with the present response, the specification has been suitably revised to correct informalities and to provide antecedent basis for the claim language. Independent claim 1 has been amended to clarify the structure of the X-ray fluorescence analysis apparatus and to further patentably distinguish from the prior art of record.

Independent claim 7 has been amended to clarify the structural combination of a high-voltage cable, plug, sheath, and conductor and to further patentably distinguish from the prior art of record. Claims 2-3, 5, 6 and 8-12 have been amended to conform to the amendments to independent claims 1 and 7. Claims 2, 3 and 8 have also been amended to overcome the rejection under 35 U.S.C. §112, second paragraph. Claim 4 has been canceled. New claims 13-22 have been added to provide a fuller scope of coverage. The title of the invention has been changed to "X-Ray Fluorescence Analysis Apparatus Having Short-Circuiting Connecting Structure" to more clearly reflect the invention to which the claims are directed. A new, more descriptive abstract has been substituted for the original abstract.

In view of the foregoing, applicants respectfully submit that the objections to the title, abstract and claims and the rejection of claims 2, 3 and 8 under 35 U.S.C. §112, second paragraph, have been overcome and should be withdrawn.

Applicants respectfully request reconsideration of their application in light of the following discussion.

Brief Summary of Invention

The present invention is directed to an X-ray fluorescence analysis apparatus having a short-circuiting connecting structure.

A conventional X-ray fluorescence analysis apparatus has an X-ray tube, a high-voltage power supply, and a high-voltage cable for connecting the X-ray tube to the high-voltage power supply. During transportation of the conventional X-ray fluorescence analysis apparatus, a load is accumulated in the high-voltage cable, even though no high-voltage is applied to the high-voltage power supply, as a result of contact between conductors within the high-voltage cable. If a conductive core of the high-voltage cable is touched while the high-voltage cable in this charged state, an electric shock due to static electricity will be experienced.

The present invention overcomes the drawbacks of the conventional art. The X-ray fluorescence analysis apparatus according to the present invention is of the type which has a first housing for housing an X-ray tube for irradiating a sample to be measured with primary X-rays, a second housing for housing a high-voltage power supply for supplying a high-voltage to the X-ray tube, and a high-voltage cable for connecting the X-ray tube to the high-voltage power supply.

Figs. 1-2 show an embodiment of the inventive aspects of the X-ray fluorescence analysis apparatus according to the present invention embodied in amended independent claim 1. The high-voltage cable has a core 21, an insulator 22 covering the core 21, and a shielding wire 23 covering the insulator 22. A high-voltage connector is disposed at least

at one end of the high-voltage cable and has a first connecting member 24 for removably connecting the high-voltage cable to a receptacle provided on one of the first and second housings. A removable sheath 1 covers an exposed portion of the core 21 of the high-voltage cable. The sheath 1 has a second connecting member 2 for electrical and mechanical connection to the first connecting member 24 of the high-voltage connector to removably connect the sheath 1 to the high-voltage connector. A conductor 3 is disposed at an inner surface of the sheath 1 for contacting the core 21 of the high-voltage cable to electrically connect the core 21 to the shielding wire 23 of the high-voltage cable when the second connecting member 2 of the sheath 1 is electrically and mechanically connected to the first connecting member 24 of the high-voltage connector.

Thus the X-ray fluorescence analysis apparatus embodied in amended independent claim 1 requires that when the second connecting member of the sheath is electrically and mechanically connected to the first connecting member of the high-voltage connector, the conductor, which is disposed at the inner surface of the sheath, contacts the core of the high-voltage cable to electrically connect the core to the shielding wire of the high-voltage cable. By this construction, the core and the shielding wire of the high-

voltage cable are short-circuited. As a result, the accumulation of charge between the core and the shielding wire of the high-voltage cable due to static electricity is avoided.

Traversal of Prior Art Rejections

Claims 1, 5-7 and 9-12 were rejected under 35 U.S.C. §103(a) as being unpatentable over Dumire. Applicants respectfully traverse this rejection and submit that the teachings of Dumire do not disclose or suggest the subject matter recited in amended independent claims 1 and 7 and dependent claims 5, 6 and 9-12.

Amended independent claim 1 is directed to an X-ray fluorescence analysis apparatus and requires a first housing for housing an X-ray tube for irradiating a sample to be measured with primary X-rays, a second housing for housing a high-voltage power supply for supplying a high-voltage to the X-ray tube, and a high-voltage cable for connecting the X-ray tube to the high-voltage power supply and having a core, an insulator covering the core, and a shielding wire covering the insulator. Amended independent claim 1 further requires a high-voltage connector disposed at least at one end of the high-voltage cable and having a first connecting member for removably connecting the high-voltage cable to a receptacle

provided on one of the first and second housings, and a removable sheath for covering an exposed portion of the core of the high-voltage cable, the sheath having a second connecting member for electrical and mechanical connection to the first connecting member of the high-voltage connector to removably connect the sheath to the high-voltage connector. Amended independent claim 1 further requires a conductor disposed at an inner surface of the sheath for contacting the core of the high-voltage cable to electrically connect the core to the shielding wire of the high-voltage cable when the second connecting member of the sheath is electrically and mechanically connected to the first connecting member of the high-voltage connector. No corresponding structural and functional combination is disclosed or suggested by the prior art of record.

Dumire discloses a coaxial cable connector having a cable 10 having a conductor 13, a connecting member 33, a sheath (adapter) 30, and a contact member 36 disposed in the adapter 30 and connected to the conductor 13. However, as recognized by the Examiner, Dumire does not disclose or suggest a conductor disposed at an inner surface of the sheath for contacting the core of the high-voltage cable to electrically connect the core to the shielding wire of the high-voltage cable when the second connecting member of the

sheath is electrically and mechanically connected to the first connecting member of the high-voltage connector, as recited in amended independent claim 1. More specifically, in Dumire the sheath 30 is not conductive and the contact member 36 is not in electrical contact with the sheath 30. Accordingly, Dumire's coaxial cable connector clearly does not contain a conductor for contacting a core of a high-voltage cable to electrically connect the core to a shielding wire of the high-voltage cable, as required by amended independent claim 1.

Amended independent claim 7 also requires a conductor disposed at an inner surface of the sheath for contacting the exposed portion of the conductive core of the high-voltage cable to electrically connect the conductive core to the shielding wire of the high-voltage cable when the sheath is removably connected to the connecting member of the plug and, therefore, distinguishes from the coaxial cable connector of Dumire in the same manner as set forth above for amended independent claim 1.

Claims 5-6 and 9-12 depend on and contain all of the limitations of amended independent claims 1 and 7, respectively, and, therefore, distinguish from the reference at least in the same manner as claims 1 and 7.

In view of the foregoing, applicants respectfully submit that the rejection of claims 1, 5-7 and 9-12 under 35 U.S.C. §103(a) as being unpatentable over Dumire has been overcome and should be withdrawn.

Claims 1-3 and 5-12 were rejected under 35 U.S.C. §103(a) as being unpatentable over Dumire in view of Jackson. Applicants respectfully traverse this rejection and submit that the combined teachings of Dumire and Jackson do not disclose or suggest the subject matter recited in amended independent claims 1 and 7 and dependent claims 2, 3, 5, 6 and 8-12.

The primary reference to Dumire does not disclose or suggest the subject matter recited in amended independent claims 1 and 7 as set forth above for the rejection of claims 1, 5-7 and 9-12 under 35 U.S.C. §103(a).

The secondary reference to Jackson has been cited by the Examiner for its disclosure of a coaxial adapter purportedly having a connector 12, 13 with conductors 18, 19 for connecting a cable core to a cable shield. However, Jackson does not disclose or suggest the structural combination of the conductor, sheath, and first and second connecting members recited in amended independent claims 1 and 7. Thus Jackson clearly does not disclose or suggest a conductor disposed at an inner surface of a sheath for

contacting the core of the high-voltage cable to electrically connect the core to the shielding wire of the high-voltage cable when the second connecting member of the sheath is electrically and mechanically connected to the first connecting member of the high-voltage connector, as recited in amended independent claim 1. Likewise, Jackson does not disclose or suggest a conductor disposed at an inner surface of the sheath for contacting the exposed portion of the conductive core of the high-voltage cable to electrically connect the conductive core to the shielding wire of the high-voltage cable when the sheath is removably connected to the connecting member of the plug, as recited in amended independent claim 7. Since Jackson does not disclose or suggest these features, it does not cure the deficiencies of Dumire. Accordingly, one ordinarily skilled in the art would not have been led to modify the references to attain the claimed subject matter.

Claims 2, 3, 5, 6 and 8-12 depend on and contain all of the limitations of amended independent claims 1 and 7, respectively, and, therefore, distinguish from the references at least in the same manner as claims 1 and 7.

In view of the foregoing, applicants respectfully submit that the rejection of claims 1-3 and 5-12 under 35 U.S.C. §103(a) as being unpatentable over Dumire in view of Jackson has been overcome and should be withdrawn.

Claims 1, 3, 5-7 and 9-12 were rejected under 35 U.S.C. §103(a) as being unpatentable over Lombard alone or in view of Dumire, Bliss and Peterson. Applicants respectfully traverse this rejection and submit that the teachings of Lombard or the combined teachings of Lombard, Dumire, Bliss and Peterson do not disclose or suggest the subject matter recited in amended independent claims 1 and 7 and dependent claims 3, 5, 6 and 9-12.

Amended independent claims 1 and 7 recite the subject matter described above with reference to the rejection of claims 1, 5-7 and 9-12 under 35 U.S.C. §103(a).

The primary reference to Lombard discloses a circuit having a shorting and grounding plug 10 having resilient fingers 50 which engage pins 20 (Figs. 1-4). However, Lombard does not disclose or suggest a conductor for contacting a core of a high-voltage cable to electrically connect the core to a shielding wire of the high-voltage cable, as required by amended independent claims 1 and 7. More specifically, in Lombard the pins 20 are electrically coupled with a body 14 via an end flange 38 of the shorting and grounding plug 10. While the plug may be effective in preventing a charge of static electricity from accumulating on one or more of the pins 20 or in some portion of the circuit, Lombard clearly does not disclose or suggest that the pins 20 (i.e., cores)

are electrically connected to a shielding wire of a high-voltage cable, as required by amended independent claims 1 and 7.

The secondary references to Dumire, Bliss and Peterson have been cited by the Examiner for their disclosure of wire cores and connectors joined to cables. However, none of the secondary references discloses or suggests a conductor disposed at an inner surface of the sheath for contacting the core of the high-voltage cable to electrically connect the core to the shielding wire of the high-voltage cable when the second connecting member of the sheath is electrically and mechanically connected to the first connecting member of the high-voltage connector, as recited in amended independent claim 1. Likewise, the secondary references do not disclose or suggest a conductor disposed at an inner surface of the sheath for contacting the exposed portion of the conductive core of the high-voltage cable to electrically connect the conductive core to the shielding wire of the high-voltage cable when the sheath is removably connected to the connecting member of the plug, as recited in amended independent claim 7.

For example, Peterson discloses electrical connectors having cables shielded by a shielding wire 14 (Figs. 1 and 3). The shielding wire 14 is electrically coupled with the body of a sleeve and with metal coupling nuts

38 as described in column 4, line 62-67. However, unlike the present invention embodied in amended independent claims 1 and 7, Peterson's connector is not a high-voltage connector and Peterson does not deal with the problem associated with high-voltage cables, that is, the large accumulation of electric charge between a shielding wire and the cable core.

Since Dumire, Bliss and Peterson do not disclose or suggest the foregoing features recited in amended independent claims 1 and 7, they do not cure the deficiencies of Lombard. Accordingly, one ordinarily skilled in the art would not have been led to modify the references to attain the claimed subject matter.

Claims 5-6 and 9-12 depend on contain all of the limitations of amended independent claims 1 and 7, respectively, and, therefore, distinguish from the references at least in the same manner as claims 1 and 7.

In view of the foregoing, applicants respectfully submit that the rejection of claims 1, 5-7 and 9-12 under 35 U.S.C. §103(a) as being unpatentable over Lombard alone or taken in view of Dumire, Bliss and Peterson has been overcome and should be withdrawn.

Claims 2, 3 and 8 were rejected under 35 U.S.C. §103(a) as being unpatentable over Lombard in view of Bliss, Dumire and Peterson. Applicants respectfully traverse this

rejection and submit that the combined teachings of Lombard, Dumire, Bliss and Peterson do not disclose or suggest the subject matter recited in claims 2, 3 and 8.

Lombard in view of Bliss, Dumire and Peterson does not disclose or suggest the subject matter recited in amended independent claims 1 and 7 as set forth above for the rejection of claims 1, 5-7 and 9-12 under 35 U.S.C. §103(a). Claims 2, 3 and 8 depend on contain all of the limitations of amended independent claims 1 and 7, respectively, and, therefore, distinguish from the references at least in the same manner as claims 1 and 7.

In view of the foregoing, applicants respectfully submit that the rejection of claims 2, 3 and 8 under 35 U.S.C. §103(a) as being unpatentable over Lombard in view of Bliss, Dumire and Peterson have been overcome and should be withdrawn.

Applicants respectfully submit that the prior art of record also does not disclose or suggest the subject matter recited in newly added claims 13-22.

New independent claim 13 is directed to an X-ray fluorescence analysis apparatus and requires a first housing for housing an X-ray tube for irradiating a sample to be measured with primary X-rays, a second housing for housing a high-voltage power supply for supplying a high-voltage to the

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X-ray tube, a high-voltage cable for connecting the X-ray tube to the high-voltage power supply, the high-voltage cable having a conductive core, an insulator covering the conductive core except for an exposed end portion of the conductive core, and a shielding wire covering the insulator, and connecting means for covering the exposed end portion of the conductive core and for electrically connecting the conductive core to the shielding wire of the high-voltage cable when the high-voltage cable does not connect the X-ray tube to the high-voltage power supply. The prior art of record does not disclose or suggest the specific function of the connecting means recited in independent claim 13 as set forth above for amended independent claims 1 and 7. Furthermore, the prior art of record does not disclose or suggest the structure described in the specification for the "connecting means" recited in claim 13, and equivalents thereof.

Claims 14-20 depend on contain all of the limitations of independent claim 13 and, therefore, distinguish from the references at least in the same manner as claim 13.

New independent claim 21 is directed to the combination of a high-voltage cable, a high-voltage connector having a connecting member electrically connected to shielding wire of the high-voltage cable so that an exposed portion of

the conductive core extends therefrom, the connecting member having a connecting portion for connecting the exposed portion of the conductive core to a receptacle of an electrical apparatus to establish an electrical connection therewith. Claim 21 also requires a connecting structure having a connecting portion for connection to the connecting member of the high-voltage connector, a cover portion for covering the exposed portion of the conductive core of the high-voltage cable when the connecting portion is connected to the connecting member of the high-voltage connector, and a conductor member disposed in the cover portion to electrically contact the exposed portion of the conductive core of the high-voltage cable when the connecting portion is connected to the connecting member of the high-voltage connector for short-circuiting the conductive core and the shielding wire of the high-voltage cable to prevent electric charges from accumulating between the conductive core and the shielding wire. No corresponding structural combination is disclosed or suggested by the prior art of record as set forth above for amended independent claims 1 and 7.

Claim 22 depends on and contains all of the limitations of independent claim 21 and, therefore, distinguishes from the references at least in the same manner as claim 21.

In view of the foregoing amendments and discussion,
the application is believed to be in allowable form.
Accordingly, favorable reconsideration and allowance of the
claims are most respectfully requested.

Respectfully submitted,
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March 17, 2004

Date